

ACCESSION #: 9609230122

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Zion Nuclear Power Station Unit 1 PAGE: 1 OF 4

DOCKET NUMBER: 05000295

TITLE: UNIT 1 REACTOR TRIP DURING PARTIAL STROKE TEST OF THE  
MAIN STEAM INSULATION VALVE DUE TO LIMIT SWITCH FAILURE  
CAUSED BY INADEQUATE MANAGERIAL METHODS

EVENT DATE: 08/18/96 LER #: 96-021-00 REPORT DATE: 09/17/96

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: N. Brennan, Regulatory Assurance, TELEPHONE: (847) 746-2084  
ext. 2380

COMPONENT FAILURE DESCRIPTION:

CAUSE: E SYSTEM: SB COMPONENT: ISV MANUFACTURER: N007

REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

At approximately 1127 hours on August 18, 1996, the Unit 1 Nuclear Station Operator (NSO) tested the 1D Main Steam Isolation Valve (MSIV) in accordance with the Periodic Test (PT)-3D, "Main Steam Isolation Valves Quarterly Check." This test partially closes the MSIVs to prove operability. After the NSO placed the 1D MSIV test switch in the closed position the externally mounted MSIV limit switch failed to stop MSIV motion.

The NSO released the switch, opening the MSIV. The 1D MSIV partial closure malfunction caused the 1D Steam Generator Level to decrease rapidly to the 10% low-low Steam Generator Level protective setpoint. The Reactor Protection System sensed the low-low steam generator level and functioned to cause a reactor trip. A reactor trip occurred at 1133 hours on August 18, 1996.

The Intermediate MSIV Position Limit Switch (IMPLS) on the 1D MSIV failed. A formal failure analysis revealed that the internal moving components of the IMPLS were not operating freely due to lubricant that had become dried and highly viscous. The cause of this event was an inadequate Preventive Maintenance program due to Managerial Methods in that management did not apply lessons learned from industry experience to prevent the limit switch failure.

Corrective actions include: The IMPLS was replaced, the MSIV was successfully tested, and the operation of the new IMPLS was verified acceptable. In addition, the station replaced all Unit 1 IMPLSs and all Unit 2 IMPLSs will be replaced in the next outage. Regarding actions to prevent recurrence, the station will include the Unit 1 and Unit 2 IMPLS in the PM program, and PT-3D will be revised to include mitigating actions. Zion Station will apply lessons learned from industry experience to limit switches in critical applications.

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#### A. PLANT CONDITIONS PRIOR TO EVENT

Unit 1 MODE 1 - Power Operations Rx Power 100%

RCS [AB]Temperature/Pressure 558 F / 2235 psig

#### B. DESCRIPTION OF EVENT

At approximately 11:27 hours on August 18, 1996, the Unit 1 Nuclear Station Operator (NSO) began testing the Unit 1 Main Steam [SB] Isolation Valves (MSIVs). This test partially closes the MSIVs to prove operability in accordance with the technical specifications. The NSO was performing the test from the control room with the assistance of a local operator stationed in the MSIV room. The two operators were in

communication using an open phone line. The 1A, 1B, and 1C MSIVs were tested without incident. In accordance with the Periodic Test (PT) PT-3D (Main Steam Isolation Valves Quarterly Check) procedure, the NSO placed the 1D MSIV test switch in the closed position. At this point, the MSIV appears to have continued past the 10% closed position.

The MSIV test circuit is designed to stop the valve from closing when it reaches the 10% closed position. This feature is dependent upon proper operation of a limit switch. If operating properly, the limit switch stops the MSIV travel by closing a hydraulic fluid drain valve and illuminates an amber light on the control panel. In accordance with the PT-3D, when the amber light illuminates, the NSO releases the MSIV test switch to allow the MSIV to return to the full open position.

The 1D MSIV IMPLS failed to operate when required. The 1D MSIV continued to travel in the closed direction until the NSO realized the anomalous situation, at which time he released the switch, but the MSIV had traveled too far in the closed direction. As the valve continued to travel in the closed direction, steam flow in the 1D Steam Generator [SJ] (SG) began to decrease. As steam flow decreased, SG level decreased because of shrink. The steam flow / feed flow mismatch was sensed by the feedwater control system, feed flow in the 1D SG was automatically reduced in response and a level decrease in the 1D SG resulted, causing the Unit 1 reactor trip. The reactor trip occurred when the SG Low-Low level protective setpoint, 10% of narrow range level span, was reached at

11:33 on August 18, 1996. Upon reaching the reactor protection setpoint, all protection systems actuated as designed.

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#### C. CAUSE OF EVENT

The intermediate MSIV position limit switch (IMPLS) failed to operate when required. The limit switch internal contacts failed to complete the electrical circuit that would have prevented the MSIV excessive closure.

The IMPLS failure analysis identified that grease had dried inside the device. The root cause of the event was inadequate Preventive Maintenance (PM) due to Management Deficiency in that the Operating Experience (OPEX) program was not used to affect or improve PM from lessons learned and corrective actions taken for similar events at other sites.

#### D. SAFETY ANALYSIS

The safety impact of this event was minimal. The intermediate MSIV position limit switch is not a safety related component, and it does not perform a safety related function. The IMPLS provides MSIV partial stroke position indication and automatically isolates the hydraulic fluid drain path at the 10% closed setpoint. The failed IMPLS allowed the 1D MSIV to stroke closed beyond the 10% closed point, possibly up to 20% closed, but not fully closed. In addition, the partial stroke hydraulic circuit is a slow acting system which provides for soft closure if the

MSIV had gone fully shut. Therefore, the IMPLS failure caused a minimal challenge to the MSIV, structurally. In response to the failure, the safety related portions of the MSIV system were not affected, and the reactor protection system initiated a reactor trip after a protective setpoint was reached.

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#### E. CORRECTIVE ACTIONS

1. The 1D IMPLS was replaced, the MSIV was successfully tested, and the operation of the 1D IMPLS was verified acceptable.

2. All Unit 1 IMPLSs were replaced.

3. PT-3D will be revised to include mitigating actions.

(29518096192901)

4. All Unit 2 IMPLSs will be replaced in the next outage.

(29518096192902)

5. The Unit 1 and Unit 2 IMPLS will be included in the PM program.

(29518096192903)

6. Zion Station will apply lessons learned from industry experience to limit switches in critical applications. (29518096192904)

7. Zion Station will review the effectiveness of the OPEX program in terms of results achieved by learning from the industry's problems and corrective actions. (29518096192905)

#### F. PREVIOUS EVENTS SEARCH AND ANALYSIS

No previous similar events were identified for Zion Station, but six similar events were identified through the Nuclear Plant Reliability Data System (NPRDS). This industry experience was used in designing corrective actions.

#### G. COMPONENT FAILURE DATA

The limit switch in question was manufactured by NAMCO and is model number SL3WZ, a commercial grade, non Environmentally Qualified (EQ) model. Analysis of the NAMCO, SL3WZ showed the following: internal electro-mechanical components were slow acting, and lubrication for internal moving parts appeared dry and highly viscous. The IMPLS was installed intending to run until failure.

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Zion Generating Station

101 Shiloh Blvd.

Zion, Illinois 60099

Telephone 708 / 746-2084

September 17, 1996

U.S. Nuclear Regulatory Commission

Document Control Desk

Washington, DC 20555

Dear Sir/Madam:

The enclosed Licensee Event Report number 96-021-00, Docket No. 50-295/DPR-39 from Zion Generating Station is being transmitted to you in accordance with the 10 CFR 50.73(a)(2)(iv) which requires a thirty-day written report when any event or condition resulted in a manual or automatic actuation of any engineered safety feature, including the reactor protection system.

Very truly yours,

G. K. Schwartz

Station Manager

Zion Generating

GKS/hjw

Enclosure: Licensee Event Report

cc: NRC Region III Administrator

NRC Resident Inspector

IDNS Resident Inspector

INPO Record Center

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